

with the surface at P. Since this angle is directly proportional to the distance between the two wave surfaces, the normal at any point—that is, the direction of the ray—varies at a constant rate, and is therefore the arc of a circle. If $v_e = x$ and R_e is the radius of this circle (which may be called the refractive radius),

$$R_e \frac{x}{H} = x, \text{ so that } R_e = \frac{H}{a}.$$

In geographical miles $H = 4.32$ about, which makes

$$R_e = 14,900 \text{ miles.}$$

The course of the ray is the same as it would be if it passed through an infinite number of vertically placed acute prisms of height H , having a refractive index $\mu_0/(1-a)$, with their bases occupying the whole surface of the ground. Since for horizontal rays these prisms are in the position of minimum deviation, rays which are pointed a few degrees up or down will still be arcs of the circle with 14,900 miles radius. The usual tables for the distance of the sea horizon assume that the horizon is x miles distant, when the height of the eye (h) = $\frac{x^2}{2 R_e}$, R_e being the earth's radius.

If refraction is taken into account,

$$h = \frac{x^2}{2} \left(\frac{1}{R_e} - \frac{1}{R_r} \right),$$

or, in numbers, without refraction,

$$h = 0.87 x^2;$$

with refraction allowed for,

$$h = 0.67 x^2.$$

Thus the sea horizon viewed from a height h , or a mountain of this height just visible from sea-level, is a good deal further off than the ordinary tables would indicate.

If an atmosphere of the same height and density as that of the earth covered a globe of 14,900 miles radius, an elevation at any one point of its surface would be visible from every other point, and a light at one end of a diameter would appear to an observer at the other end as a bright line extending round the whole of his horizon. A. MALLOCK.

9 Baring Crescent, Exeter, May 12.

Young's Interference Experiment and the Spectrometer.

IN NATURE of April 28, p. 268, Dr. R. A. Houstoun directs attention to the use of the spectrometer for Young's double-slit experiment. In a letter on "The Visibility of Interference Fringes and the Double Slit" (NATURE, July 26, 1917, vol. xcix., p. 424) the present writer made reference to a similar optical arrangement. In that letter emphasis was laid, not on the advantages of the method for observing fringes and evaluating wave-length, but on its use for studying the changes in the visibility of fringes which occur as the width of the spectrometer slit is altered. In view of Prof. Michelson's recent use of the double slit for the measurement of the angular width of distant stars, I may be pardoned for directing attention to my note of some years ago, and for pointing out the ease with which an experiment similar in method to that of Prof. Michelson may be performed by means of an ordinary spectrometer. It is true that, instead of using a source of fixed (but finite) width and a variable double slit, the converse arrangement was employed, but in principle the methods are identical. It might be worth while, however, to vary the experiment by replacing the spectrometer slit by a small circular aperture and using a double slit of variable width.

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May I also point out that the spectrometer may be used advantageously for an experiment on the limit of resolution of a telescope? It will be recalled that in the standard experiment a distant piece of gauze of fairly large mesh is viewed through a telescope before the objective of which an aperture is gradually narrowed until one set of wires disappears. If the slit of the collimator of a spectrometer be removed and in its place a piece of gauze of fine mesh be substituted, a much more convenient arrangement is available. During the past winter I found that students make quantitative measurements with such an arrangement without even darkening the laboratory.

In conclusion, it is well to note that for much of the above work even a spectrometer is not necessary. A telescope, a good lens, and adjustable slits are the only essentials.

JOHN K. ROBERTSON.

Queen's University, Kingston, Canada,

May 12.

The Reparation Act and Scientific Research.

THE columns of NATURE could, no doubt, be crowded with complaints concerning the Reparation Act, but as a sufferer I may be permitted to give the following instance of the extraordinary way in which this Act is used to hinder research.

I ordered a case of chemicals from Germany for myself and other workers in the Biochemical Laboratory, Cambridge, on February 2. In order that these should not come under the Reparation Act, they were dispatched on March 24 and arrived on April 8. Although the Reparation Act did not come into force until April 15, the goods were seized at Grimsby, and after a week's delay I was asked for all the original documents showing that the goods were ordered before March 8 and delivered before April 15. These were at once sent to London, but no reply was received from the Customs until I was forced to request the Medical Research Council, for whose work the chemicals were required, to apply to the Customs to free the goods as soon as possible. After three weeks' delay I received a letter from the Customs saying that the original documents were insufficient, and that a statutory declaration was required to confirm the particulars and to prove that the contract had not been fulfilled. This necessitated two visits to a commissioner of oaths and the preparation of a lengthy manuscript document adorned with red seals, the cost of which I have still to discover. This evidence was forwarded to the Customs a fortnight ago, and I have received no answer. The goods are still at Grimsby, the work of several people is being delayed, and the goods will apparently remain impounded (although they never came under the Act) unless I am prepared to submit to what might almost be called blackmail. To obtain the chemicals I must pay the full 50 per cent. myself, the funds of the Medical Research Council being unavailable for the purpose, and I must trust to recover the money from the Customs when my claim has been recognised—evidently a very doubtful eventuality.

All this delay, the expense, including the commissioners of oaths, not to speak of the worry and waste of time of an interminable correspondence, are apparently due to nothing but the red tape of a Government office.

H. ONSLOW.

May 27.

British Laboratory Ware and Chemicals.

THE question of the quality, supply, and prices of British laboratory glassware, porcelain, and chemicals, including research chemicals, is under consideration by a committee of the British Science Guild. The

committee, the chairman of which is Sir Richard Gregory, is anxious, in view of the conflicting statements which have appeared from time to time on these matters, to obtain the views of scientific workers who have experience of recent articles of the kind described, both of British and foreign manufacture. It is obvious that the information can be of use only when it applies to goods of definitely known origin. The points on which information is desired are:—The quality of the goods; their price as compared with that of imported articles of the same quality; the facilities for obtaining supplies; and the effects, if any, on research work of restrictions imposed on the importation of German goods. The committee would also welcome statements made, or reasoned conclusions arrived at, by competent bodies who have investigated these questions recently, and from manufacturers who wish to add any further definite information to that which has already appeared in the Press. The information should be sent to the secretaries of the committee, Prof. J. R. Partington, East London College, or Mr. C. L. Bryant, 23 Peterborough Road, Harrow, as soon as possible.

J. R. PARTINGTON.
C. L. BRYANT.

Science and Technology in Palestine.

In a lucid article, "Water-Power of Jordan," which appeared in the *Times* of May 18 the twofold scheme of the Jewish engineer, Mr. Rutenberg, was explained. Mr. Rutenberg proposes, first, to establish a barrage at the southern end of the Sea of Galilee to be used as the main power-house for the general purpose of electrification. Secondly, the malaria-breeding marshes of Lake Huleh are to be drained and a power-house constructed which will utilise the fall of the Jordan between Lake Huleh and the Sea of Galilee for power generation.

Readers of *NATURE* may be interested in a few further details of these plans. The latest calculations value the total potential water-power of Palestine at 1,000,000 h.p., plus a water-supply which will suffice to irrigate 1,200,000 acres of land. There is, of course, no intention of generating electricity to the full extent of this power; e.g. the proposed power station on the lower part of the Jordan, capable of generating 100,000 h.p. in twenty-four hours, would be sufficient to electrify the already existing railways of Palestine—which would need approximately 30,000,000 kw.h. per annum—as well as to supply the present general needs of Palestine. This station would also produce about 200,000,000 cubic yards of water for irrigation purposes; the installation would probably cost about 2,000,000l.

It is not necessary to emphasise the value of such schemes, both as regards increased fertility and productivity of the land, and in their effects on the social and economic life of the country.

In view of the local need for scientific knowledge, particular attention has to be paid to the Scientific Department which is to form the nucleus of the proposed University of Jerusalem. Already in 1913 Dr. Weizmann and the University Committee (whose chief scientific adviser was the late Prof. Paul Ehrlich) decided that research institutes should be founded, to be transformed as soon as possible into complete teaching faculties. Institutes of physics, chemistry, and microbiology were included in the initial scheme. It is hoped that through these institutes opportunity will be given for the solution of practical problems by Jewish experts on the spot. Obviously, from a practical point of view, it is better that Jewish talent should be utilised locally in this way, and from a

wider point of view the University in its humanitarian as well as in its scientific aspects will form an integral part of the national life.

DAISY L. ADLER.

The Zionist Organisation, 77 Great Russell Street, London, W.C.1, May 20.

Foreign Scientific Literature.

PROF. GARDINER in *NATURE* of May 19, p. 359, writes of the difficulty of obtaining Continental publications, whilst the complaint from Central Europe is all about the difficulty of getting English scientific literature. Perhaps something can be done by exchange. There are probably readers of *Die Naturwissenschaften* and of the *Elektrotechnische Zeitschrift* willing and eager to exchange with *NATURE* and the *Electrician*. Second-hand books with pages cut and owners' names inscribed would probably follow the analogy of worn clothes and be exempt from the interest of Customs officials. A year ago the Swiss bookshops in Berne seemed to carry a heavy stock of recent German scientific literature. Travellers returning from the Alps may wish to inspect these. For exchange of transactions of learned societies the mediation of the Anglo-American Library (hon. secretary, Mr. B. M. Headicar, School of Economics, Clare Street, London, W.C.2) might be invoked.

HUGH RICHARDSON.

Stocksfield-on-Tyne, May 26.

Flint Implements in the Cromer Forest Bed.

SINCE the reading of my paper on the humanly fashioned flints found upon the foreshore at Cromer before the Royal Anthropological Institute on May 3, I have again visited the Norfolk coast. This visit, in company with my friend Mr. Frank Barclay, of Cromer (who has recently collected close upon one thousand specimens of the ochreous artefacts from the foreshore), has resulted in the discovery of two flints, exhibiting the now well-known yellow coloration, *in situ* in the surface of the ferruginous "pan" or Stone Bed resting upon the chalk, and exposed, I conclude recently, at the base of the cliff above the beach deposits under Beeston Hills at Sheringham. This ferruginous deposit is of extreme hardness, and the two ochreous flints discovered could be dislodged only with great difficulty. There is, therefore, no doubt of any kind that the specimens form part of the deposit in which they occurred, which, without question, passes in under the very lofty cliff present at this spot.

Mr. Clement Reid ("Pliocene Deposits of Britain," p. 155) regarded the "pan" and Stone Bed at Sheringham as of Weybourne Crag age, and I think that, speaking generally, this opinion is correct. The two flints which have now been found were embedded in the surface of the Stone Bed, associated with a number of examples of clay pebbles such as occur in the lowermost strata of the Cromer Forest Bed deposits, and seem, therefore, to be referable to the horizon mentioned by me (*NATURE*, February 10, 1921) as that to which the Cromer artefacts might, in all probability, belong.

I have now found that the ochreous flint implements and flakes occur upon the foreshore exposed at low water at Sheringham and West and East Runton, as well as at Cromer, though they are much more numerous at the latter place. The peculiar form and technique of the specimens from all the sites mentioned are almost precisely similar, and I entertain no doubt that they may all be referred to one and the same "industry." The two flints now discovered, to which this letter especially relates,